CANCER

IOM Issues Report on Breast Cancer and the Environment

The Institute of Medicine (IOM) recently set out to review the current evidence on links between breast cancer and the environment. Their conclusions, published in a report issued 7 December 2011,[1] point to a range of actions women can take to reduce their risk: maintain a healthy weight, limit alcohol use, don't smoke, forego certain forms of postmenopausal hormone therapy, and avoid excessive medical imaging when possible. Conclusive evidence links each of these factors to breast cancer, while the evidence supporting other factors—notably exposure to industrial and workplace chemicals—remains less certain, according to the report's authors.

Commissioned by Susan G. Komen for the Cure®, a Dallas, Texas–based cancer research advocacy group, the report was prepared by a 15-member panel from academia and community health centers. The panel defined "environment" as any factor that isn't inherited through DNA and relied on evidence compiled by the International Agency for Research on Cancer and the World Cancer Research Fund International, in addition to findings from the scientific literature.

Breast cancer risk factors were divided into 3 categories—established, possible, and biologically plausible—on the basis of the strength of the data, according to panelist Robert Hiatt, a professor of epidemiology and biostatistics at the University of California, San Francisco. "Established" risk factors were supported by strong human epidemiologic data, in addition to positive results from animal and mechanistic studies. Risk factors were assigned a "possible" status if the available human data were in conflict and a "biologically plausible" status if they were supported solely by animal and mechanistic studies.

Remarkably, only a few established risk factors were identified, among them combined hormone therapy with estrogen and progestin, exposure to ionizing radiation (such as that delivered by computed tomographic scans), excess weight in postmenopausal women, and excessive alcohol use. Possible risk factors include nighttime shift work and exposure to secondhand smoke, benzene, ethylene oxide, and 1,3-butadiene. The biologically plausible category is populated mainly by industrial chemicals, including metals, pesticides, and the plastics constituent bisphenol A, which is ubiquitous in consumer products, the environment, and people, and therefore exceedingly challenging to study in controlled epidemiologic studies, according to Hiatt.

By emphasizing lifestyle changes in prevention, the IOM distinguished itself from the President's Cancer Panel (PCP), which in spring 2010 released a headline-grabbing annual report[2] stressing that chemical exposures have a "grossly underestimated" impact on cancer risk.[3] The first of the PCP's annual reports to focus specifically on the environment's role in cancer, it called explicitly for tightening regulations on chemical exposure, but the IOM avoids any similar recommendation. The new report does state that laboratory data linking chemicals to human cancer hazards "may well warrant consideration of actions by regulatory agencies that are aimed at reducing future population-based exposures."

But Hiatt says the IOM panel was charged with reviewing the current evidence, not recommending regulatory policy. In most cases, he says, more human data are needed to bolster cause–effect relationships between chemicals and breast cancer. "We usually couldn't find solid human evidence of effect," he says. "Either the data wasn't there or it was conflicting, and we had to make the call based on what we know in 2011."

The chief recommendation of the IOM is that researchers adopt a "life course" approach to studying breast cancer and the environment, with more emphasis on early-life human exposure. "One reason that we might be missing the boat on the human data is that we're looking at adult women, while carcinogenic effects may

The Beat

by Erin E. Dooley

The "Flume Room"

The University of Michigan has created a specialized laboratory containing 150 artificial mini-streams, or "flumes," that mimic a variety of river conditions as closely as possible.[1] The flumes are populated with rocks, sediment, biota, and more than 3,000 gallons of water from the Huron River. The goal is to better understand how different stressors—nutrient and chemical pollution, exotic species, species extinctions, climate change, and erosion, for instance—affect river health and "ecosystem services" provided by the Huron such as pollutant decomposition and oxygen production.

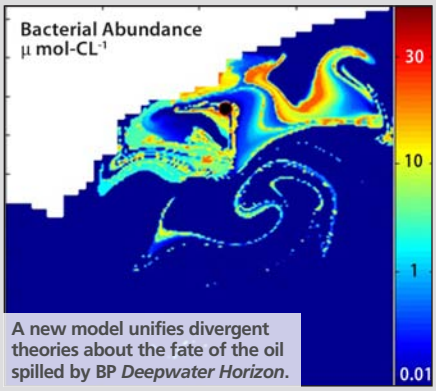
A University of Michigan researcher in the "Flume Room."

New Data on Beijing Air Pollution to Be Released

Beijing's Municipal Environmental Protection Bureau has announced it will commence publishing hourly readings for $PM_{2.5}$, PM_{10}, sulfur dioxide, and nitrogen dioxide on its website.[2] $PM_{2.5}$ data—considered a better gauge of air quality than the PM_{10} data used to this point by the Chinese government—used to be available only for laboratory use and were not disclosed to the public. Beijing currently has 6 $PM_{2.5}$ monitoring stations; additional stations will be instated before the end of 2012.

What Happened to Pollutants after the BP *Deepwater Horizon* Spill?

Investigators have modeled how the underwater topography, currents, and bacterial populations in the Gulf of Mexico helped clear away constituents of the oil spilled during the BP *Deepwater Horizon* disaster in 2010.[3] The researchers determined that the geography of the Gulf was key to keeping 50-mile-long eddies of microbe-laden water swirling over the site of the spill, continually introducing fresh loads of hydrocarbons to bacterial communities primed to degrade them by the initial load.



A new model unifies divergent theories about the fate of the oil spilled by BP *Deepwater Horizon*.

Left to right: © 2011 University of Michigan Photo Services; PNAS/ David Valentine and Igor Mezic

Environmental Factors Included in the Committee's Evidence Review*

Exogenous hormones
- Hormone therapy
- Oral contraceptives

Body fat and abdominal fat

Adult weight gain

Physical activity

Dietary factors
- Alcohol consumption
- Dietary supplements and vitamins
- Zeranol and zearalenone

Tobacco smoke
- Active smoking
- Passive smoking

Radiation
- Ionizing (e.g., X rays and gamma rays)
- Extremely low-frequency electromagnetic fields

Shift work

Metals
- Aluminum
- Arsenic
- Cadmium
- Iron
- Lead
- Mercury

Consumer products and constituents
- Alkylphenols
- Bisphenol A
- Nail products
- Hair dyes
- Parabens
- Perfluorinated compounds
- Phthalates
- Polybrominated diphenyl ethers

Industrial chemicals
- Benzene
- 1,3-Butadiene
- Polychlorinated biphenyls
- Ethylene oxide
- Vinyl chloride

Pesticides
- Dichlorodiphenyltrichloroethane/ dichlorodiphenyldichloroethylene
- Dieldrin and aldrin
- Atrazine

Polycyclic aromatic hydrocarbons

Dioxins

*The committee reviewed a select set of factors for purposes of illustration. Epidemiologic, mechanistic, or animal data relevant to mammary tumorigenesis or breast cancer are available for numerous other chemicals.

Adapted from: Breast Cancer and the Environment: A Life Course Approach; box 3-1.

result from exposures that happen while the breast is still developing," Hiatt says. "We know from animal experiments that this is a window of vulnerability to chemical insults."

Along those lines, Hiatt adds, the National Institute of Environmental Health Sciences and the National Cancer Institute are collaborating on the Breast Cancer and the Environment Research Program, which recruits subjects starting at the age of 6 years. The two institutes also collaborate on the Interagency Breast Cancer and Environmental Research Coordinating Committee, a congressionally mandated body currently preparing a comprehensive report on federal research on the environmental and genomic factors related to breast cancer. This report is expected in mid-2012.

Michael Thun, vice president emeritus of surveillance and epidemiology research at the American Cancer Society, lauds the IOM report for systematically reviewing the available evidence. "It fills an important gap," he says. "I agree with its position that we have issues of concern as research needs, but they're in a different category than well-established risk factors."

Adds Diana Rowden, vice president for survivorship and outcomes at Susan G. Komen for the Cure, "The report shows that women can reduce their breast cancer risk with actionable items undertaken now. And it challenges us to think more about how we explain cancer risk to the general population—about how different factors have their own unique influence on risk. That's an important takeaway point."

Charles W. Schmidt, MS, an award-winning science writer from Portland, ME, has written for *Discover Magazine*, *Science*, and *Nature Medicine*.

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Fukushima Cleanup Could Have Huge Environmental Impact

A year after Japan's Tohoku earthquake, tsunami, and nuclear meltdown, Japanese officials have begun a massive radioactive contamination cleanup that will require clearing at least 1,000 km^2 of land at an estimated cost of more than US$12.8 billion dollars.[4] However, removing the estimated 15–31 m^3 of contaminated soil and debris could destroy ecosystems and make areas vulnerable to flooding. The cleanup also raises the issue of where the large amounts of radioactive waste will be stored. Work is being carried out at 19 model sites to help determine the most efficient and effective methods for large-scale decontamination.

New European Rules on Phosphorus in Detergents

In December 2011 the European Parliament approved new rules on phosphorus that will limit the amount to 0.5 g per single use of laundry detergent and 0.3 g per single use of dish detergent.[5] The rules will take effect in June 2013 and January 2017, respectively. Many U.S. states began regulating phosphorus in laundry detergent in the 1980s. Dish detergent has been harder to reformulate, but in 2010 the American Cleaning Institute® adopted voluntary limits on phosphorus in this product as well.[6] Phosphorus discharged from households can contribute to harmful algal blooms in water bodies.

European householders will use low-phosphorus detergents in the near future.

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